AF/2634

Attorney Docket No. 8195-350 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Karl J. Molnar
Serial No.: 09/464,830
Filed: December 17, 1999
For: SELECTIVE JOINT DEMODULATION SYSTEMS AND METHODS FOR RECEIVING A SIGNAL IN THE PRESENCE OF NOISE AND INTERFERENCE

Group Art Unit: 2634
Examiner: Sam K. Ahn
Confirmation No.: 8144

January 21, 2004

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TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION--37 C.F.R. § 1.192)

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF for the above-identified application, pursuant to the Notice of Appeal filed on December 16, 2003.

2. This application is filed on behalf of
☐ a small entity.

3. Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:
☐ small entity $165.00
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Respectfully submitted,

Mitchell S. Bigel
Registration No. 29,614

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428, Raleigh, NC 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer No. 20792

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Susan E. Freedman

Susan E. Freedman
Date of Signature: January 21, 2004

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APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Sir:

This Appeal Brief is filed in triplicate pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed on December 16, 2003.

REAL PARTY IN INTEREST

The real party in interest is Ericsson Inc., Research Triangle Park, North Carolina, the assignee of this application.

RELATED APPEALS AND INTERFERENCES

To Appellant's knowledge, there are no currently pending appeals or interferences related to the present appeal.

STATUS OF CLAIMS

Appellant appeals the final rejection of pending Claims 1, 3, 19, and 21, which as of the filing date of this Appeal Brief remain finally rejected in the Final Official Action of December 1, 2003 (the "Final Official Action"). The attached Appendix A presents the claims at issue as rejected in the Final Official Action.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the Final Official Action of December 1, 2003.

SUMMARY OF THE INVENTION

The present invention relates to systems and methods for jointly demodulating a received signal in the presence of noise and interference. Joint demodulation is widely used to detect a desired signal from a received signal that includes an interfering signal as well. In joint demodulation, the desired signal and the interfering signal are both demodulated based on information concerning the desired signal and the interfering signal, so as to obtain a better estimate of the desired signal. *See* Specification, Page 1, lines 1-9.

Although joint demodulation can be highly effective in detecting a desired signal from a received signal that includes an interfering signal, joint demodulation may be more complex than standard or conventional demodulation, referred to herein simply as "demodulation," of a received signal. The present invention stems from a realization that joint demodulation assumes that an interfering signal is present. However, in many cases, the presence of an interfering signal depends on multipath and/or other distortions being introduced into the signal transmission path. Accordingly, the strength of the interfering signal may change over time. When joint demodulation is performed when there is little or no interference, performance of the joint demodulation may be degraded. Moreover, the additional complexity due to joint demodulation may be wasted when there is little or no interfering signal present to cancel. *See* Specification, Page 1, line 26 to Page 2, line 22.

The present invention addresses the above concerns with selective joint demodulation systems and methods. According to the present invention, consideration is made as to whether standard demodulation is sufficient or whether joint demodulation should be performed. When a signal is received in the presence of noise and interference, the present invention demodulates the signal when a relationship between the signal and the noise and the interference meets a criterion, and jointly demodulates the signal when the relationship between the signal and the noise and the interference does not meet the criterion. More specifically, demodulation may be performed when the signal-to-noise-and-interference ratio exceeds a first threshold, and joint demodulation may be performed when the signal-to-noise-and-interference ratio is less than the first threshold. *See* Specification, Page 2, lines 23-28.

Accordingly, standard demodulation and joint demodulation are selectively used where appropriate based on the relationship between the signal, the noise and the interference in a received signal. Standard demodulation may be used when interference is low or absent, whereas joint demodulation may be used when interference is significant. *See* Specification, Page 4, lines 7-11.

Pending Claims 7 – 18 and 25 – 36 have been indicated as being allowable, and pending Claims 2, 4 – 6, 20 and 22 – 24 have been indicated as being allowable if rewritten in independent form. Only Claims 1, 3, 19, and 21 have been rejected as being anticipated by U.S. Patent 6,249,518 to Cui (hereinafter "Cui"). Although it would be a simple matter to rewrite the objected-to claims in independent form and cancel the four rejected claims (Claims 1, 3, 19, and 21), Appellant respectfully submits that Claims 1, 3, 19, and 21 are not anticipated by Cui. As will be described below, Cui provides a demodulator that cancels co-channel interference, but does not describe selective joint demodulation systems and methods for receiving a signal in the presence of noise and interference. In particular, as will be described below, Cui's SA-CCIC demodulator is not a joint demodulator according to embodiments of the present invention.

ISSUES

1. Does Cui anticipate the methods and systems for selective joint demodulation recited in independent Claims 1 and 19 and dependent Claims 3 and 21?

GROUPING OF CLAIMS

For purposes of this Appeal, independent Claims 1and 19 and dependent Claims 3 and 21 may be grouped together and stand or fall together.

ARGUMENT

I. Introduction

Claims 1, 3, 19, and 21 have been rejected under 35 USC §102(e) as being anticipated by Cui.

Anticipation requires that each and every element of the claim is found in a single prior art reference. *W. L. Gore & Associates Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983). Stated another way, all material elements of a

claim must be found in one prior art source. *In re Marshall*, 198 U.S.P.Q. 344 (C.C.P.A 1978). "Anticipation under 35 U.S.C. § 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention." *Apple Computer Inc. v. Articulate Sys. Inc.*, 57 U.S.P.Q.2d 1057, 1061 (Fed. Cir. 2000). A finding of anticipation further requires that there must be no difference between the claimed invention and the disclosure of the cited reference as viewed by one of ordinary skill in the art. *See Scripps Clinic & Research Foundation v. Genentech Inc.*, 927 F.2d 1565, 1576, 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991) (Emphasis added). In fact, in a recent decision, the Court of Appeals for the Federal Circuit held that a finding of anticipation requires absolute identity for each and every element set forth in the claimed invention. *See Trintec Indus. Inc. v. Top-U.S.A. Corp.*, 63 U.S.P.Q.2d 1597 (Fed. Cir. 2002). Additionally, the cited prior art reference must be enabling, thereby placing the allegedly disclosed matter in the possession of the public. *In re Brown*, 329 F.2d 1006, 1011, 141 U.S.P.Q. 245, 249 (C.C.P.A. 1964). Thus, the prior art reference must adequately describe the claimed invention so that a person of ordinary skill in the art could make and use the invention.

As discussed in detail below, Appellant submits that the cited reference does not anticipate Claims 1, 3, 19, and 21, as this reference does not disclose joint demodulation as defined in the present application.

II. Arguments In Support Of Issues Presented

A. Claims 1, 3, 19, and 21, Related to Selective Joint Demodulation Systems And Methods For Receiving A Signal In The Presence Of Noise And Interference, Are Not Anticipated by Cui.

Independent Claims 1and 19 and dependent Claims 3 and 21 are the subject of the present appeal. Claim 1 is representative:

> 1. A method of receiving a signal in the presence of noise and interference comprising the steps of:
>
> demodulating the signal when a relationship between the signal and the noise and the interference meets a criterion; and
>
> jointly demodulating the signal when the relationship between the signal and the noise and the interference does not meet the criterion. (Emphasis added.)

Thus, Claim 1 recites that the received signal is demodulated when the relationship between the signal, noise, and interference meets one criterion, but is jointly demodulated

when the relationship between the signal, noise, and interference does not meet the criterion. As defined in the present application at Page 1, lines 6-9:

> Joint demodulation is widely used to detect a desired signal from a received signal that includes an interfering signal as well. In joint demodulation, the desired signal and the interfering signal are both demodulated based on information concerning the desired signal and the interfering signal, so as to obtain a better estimate of the desired signal. (Emphasis added.)

Page 1, lines 10-25 of the present application further cites six references which extensively describe joint demodulation, as defined above.

The Final Official Action contends that the Single Antenna – Co-Channel Interference Cancellation (SA-CCIC) demodulator of Cui is a joint demodulator. *See* Final Official Action, p. 3. Yet, rather than using the present application's conventional definition of joint demodulation, the Official Action states that:

> Joint demodulation can be defined, as stated in the specification (note 26th line on page 1 – 4th line on page 2) as a demodulator comprising more complex operation than a conventional demodulator, and detecting desired signal from a received signal that includes an interfering signal.

See Final Official Action, pp. 3-4. However, the cited passage of the present application (page 1, line 26-page 2, line 4), does not define a joint demodulator, but rather states:

> Although joint demodulation can be highly effective in detecting a desired signal from a received signal that includes an interfering signal, joint demodulation may be more complex than standard or conventional demodulation, referred to herein simply as "demodulation", of a received signal. Accordingly, there continues to be a need to provide improved systems and methods for jointly demodulating a received signal in the presence of an interfering signal.

This passage clearly states that joint demodulation may be more complex than standard or conventional demodulation but does not define joint demodulation as any demodulator that is more complex than standard or conventional demodulation. Appellant respectfully submits that such a reading would contradict the conventional definition of joint demodulation as was defined at Page 1, lines 6-9 of the present application, as described above.

Using the conventional definition of joint demodulation, Cui's SA-CCIC demodulator clearly is not a joint demodulator. For example, Cui's SA-CCIC demodulator is described in Cui's abstract as follows:

> A demodulator, within a receiver attached to a single antenna, that cancels co-channel interference within a time division multiple access (TDMA) communication system is disclosed. The demodulator takes as input a series of received signals comprising an information signal and a co-channel interference signal, both using the $\pi/4$-differential quadrature phase shift keying (DQPSK) modulation protocol. During a training period, in which the information signals corresponds to a known SYNC word, the demodulator estimates the fading coefficients corresponding to the information and interference signals. After the completion of the training period, the demodulator uses these estimates to generate accurate estimations for future information and interference signals corresponding to future data received signals. Therefore, the information signal has been essentially separated from the co-channel interference signal and can be demodulated with a lower bit error rate (BER) than previous demodulation techniques under these circumstances. (Emphasis added.)

Thus, the demodulator described in Cui **separates** the information signal from the co-channel interference, so that the information signal can be demodulated with a lower bit error rate. As such, there is clearly no description or suggestion of a joint demodulator, wherein the desired signal and the interfering signal are **both** demodulated based on information concerning the desired signal and the interfering signal, so as to obtain a better estimate of the desired signal. Therefore, each and every limitation of the claimed invention is not disclosed by Cui.

However, in the Response to Arguments section, the Final Official Action maintains that Cui's SA-CCIC demodulator is equivalent to a joint demodulator as disclosed by the present application. In particular, the Final Official Action states:

> Reading throughout the teaching of Cui, one skilled in the art would understand that Cui's teaching does teach that SA-CCIC considers the received signal comprising a desired signal and interfering signal and obtaining better estimate of the desired signal. Cui discloses detailed teaching of SA-CCIC in figure 5. The received signal, R(n) including interfering signals enter the SA-CCIC (120 in Fig.5). The outputs of decision device (512) are Si and Sd, interfering signal and desired signal, respectively. (note col.7, line 45 – col.9, line 55) These outputs are fed-back to determine a better estimation of a desired signal. (note col.9, line 56 – col.14, line 6)

See Final Official Action, p. 2.

Appellant respectfully submits that the cited portions of Cui do not disclose a joint demodulator wherein the desired signal and the interfering signal are both demodulated.

As illustrated in Figure 5, Cui teaches that the SA-CCIC demodulator **120** includes a decision device **512** which outputs a desired information signal $\hat{s}_d(n + 1)$ and an interfering signal $\hat{s}_I(n + 1)$. *See* Cui, Col. 9, lines 40-42. However, the SA-CCIC demodulator **120** itself outputs only the desired information signal $\hat{s}_d(n + 1)$. In particular, Cui states:

> The information decision signal $\hat{s}_d(n + 1)$ can thereafter be easily decoded to provide a stream of symbols as output to the demodulator.

See Cui, Col. 9, lines 55-57. As such, the interfering signal $\hat{s}_I(n + 1)$ is not output from the demodulator **120**, and is instead separated from the desired signal and fed-back into the least square estimator **508**. *See* Cui, Figure 5. Thus, the demodulator described in Cui demodulates only the desired signal. The interfering signal is not demodulated.

In contrast, the present application discloses a joint demodulator, where both the desired signal and the interfering signal are demodulated. As stated in the present application at Page 5, lines 22-25:

> Finally, a joint demodulator **120** uses the received signal **y**, the interfering signal synchronization information and the interfering signal's channel estimate, to jointly demodulate both the desired signal and the interfering signal, to produce a second detected signal $\mathbf{S_2}$, which is sent to the selector **114**. (Emphasis added.)

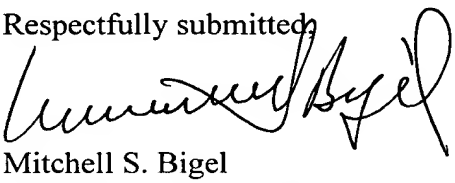
In other words, the output $\mathbf{S_2}$ of the joint demodulator **120** (i.e. the demodulated signal) comprises **both** the desired signal **and** the interfering signal. However, as discussed above, the demodulator of Cui does not demodulate the interfering signal. Rather, Cui's demodulator outputs only the desired signal. Thus, Cui does not disclose "jointly demodulating" a received signal, as described in the present application and recited by Claim 1. Accordingly, Cui does not anticipate Claim 1 under 35 USC §102(e).

In view of the above, Appellant respectfully submits that a reasonable and conventional interpretation of the present application and of Cui clearly shows that Cui does not disclose a joint demodulator, or the use of a joint demodulator as recited in Claim 1. For at least these reasons, Claim 1 is patentable over Cui. Claim 3 is patentable at least per the patentability of Claim 1 from which it depends. Claims 19 and 21 are system analogs of Claims 1 and 3, and are patentable for the same reasons that were described above. Thus, Claims 1, 3, 19, and 21 are patentable over the cited reference.

CONCLUSION

Cui relates to a demodulator that separates the desired information signal from the co-channel interference signal and outputs only the desired information signal, which is then demodulated with a lower bit error rate. However, as was shown above, jointly demodulating both the desired information signal and the interfering signal is not disclosed by Cui. For at least these reasons Appellant respectfully requests reversal of the Final Official Action, and allowance of the pending claims.

Respectfully submitted,



Mitchell S. Bigel
Registration No. 29,614
Attorney for Appellant

Customer No. 20792
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401

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Susan E. Freedman
Date of Signature: January 21, 2004

APPENDIX A

Claims at Issue USSN 09/464,830

Filed December 17, 1999

CLAIMS:

1. A method of receiving a signal in the presence of noise and interference comprising the steps of:

demodulating the signal when a relationship between the signal and the noise and the interference meets a criterion; and

jointly demodulating the signal when the relationship between the signal and the noise and the interference does not meet the criterion.

3. A method according to Claim 1:

wherein the step of demodulating comprises the step of demodulating the signal when the signal-to-noise-and-interference ratio exceeds a threshold; and

wherein the step of jointly demodulating comprises the step of jointly demodulating the signal when the signal-to-noise-and-interference ratio is less than the threshold.

19. A system for receiving a signal in the presence of noise and interference, comprising:

a demodulator that is responsive to a relationship between the signal and the noise and the interference meeting a criterion; and

a joint demodulator that is responsive to the relationship between the signal and the noise and the interference not meeting the criterion.

21. A system according to Claim 19:

wherein the demodulator is responsive to the signal-to-noise-and-interference ratio exceeding a threshold; and

wherein the joint demodulator is responsive to the signal-to-noise-and-interference ratio being less than the threshold.